Scottish Natural Heritage
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Guidance

Siting and Design of Small Scale Wind Turbines of between 15 and 50 metres in height

March 2012

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1. INTRODUCTION

Renewable energy is an increasingly important part of Scotland's economic, social and environmental success. The pace of renewable developments has increased rapidly in recent years and wind turbines are now familiar sights in many parts of the country. Scottish Natural Heritage (SNH) supports the development of renewable energy and recognises the many benefits they bring.

To this end, we are committed to helping make good renewable energy development happen in the right places. Well sited and appropriately designed turbines can be accommodated in the Scottish landscape and this guidance seeks to achieve this.

This guidance is for developers and Planning Authorities. It provides advice on the design issues relating to single and small turbine groups and it compliments our existing suite of wind energy guidance available on our website.

The guidance deals solely with the landscape and visual, siting and design aspects of proposals for small scale wind turbines. There are other issues to be taken into consideration when developing such proposals, such as habitat or species; health and safety concerns or operational requirements, but these are not considered here.

For the purposes of this guidance "small turbines" or "small-scale turbines" refers to those which are between 15 and 50 metres in height to blade tip. Siting guidance for larger turbines is available in "Siting and Designing Windfarms in the Landscape". We consider turbines of below 15 metres in height to be micro wind energy development and have produced guidance for micro renewables separately.

For every development siting and design should be informed by analysis of the key characteristics of the particular site. Although the extent of any landscape and visual impacts will obviously vary within a turbine size range of between 15 and 50 metres, this guidance attempts to provide general guidance for turbines of this scale.

Appendix 1 is a checklist of aspects to consider when developing proposals for small scale turbine development, linked to relevant parts of the text.

2. BACKGROUND

2.1 Emerging trends in small scale turbine development

There are increasing numbers of planning applications for small scale wind turbines, comprising either single turbine developments, groups of two or three small turbines, and in some cases larger groups of small turbines.

Studies have shown that people are generally in favour of wind energy development[1], although individual impacts will depend on the siting and design of the turbines, and how and where they are viewed from. Small turbines are more likely to be located in more settled lowland landscapes with a denser network of roads, nearer to residential properties, meaning that turbines are seen more frequently by a greater number of people, from varying directions, distances and elevations. It is therefore important to consider how the users of adjacent properties, including both the potential turbine owners and their neighbours, will experience them.

2.2 How this guidance fits with other SNH documents

We have a suite of guidance relating to small scale turbine development which is available on the onshore renewables pages of the SNH website. The relationship between these various guidance sources can be seen in flowchart form on our website[2]. Importantly our approach to assessing small scale turbine applications is given in other guidance. This guidance offers only siting and design advice on proposals which SNH would not routinely be consulted on, yet where negative landscape and visual impacts could be reduced by following good design principles.

This guidance also sits alongside and reflects the principles contained within Scottish Government onshore wind energy planning policy and advice Renewable Energy, as well as other industry guidance (See paragraph 3.3). It concentrates on the siting and design characteristics of the various forms of small scale turbines. It also identifies situations in which cumulative issues may be of particular importance for small scale turbines.

3. SMALL SCALE TURBINE CHARACTERISTICS

In contrast to larger scale commercial wind turbines, a greater variety of styles, designs and colours of small turbine are commonly available, generally with faster rotation speeds. We encourage continuing technical innovation that results in turbine design appropriate to Scottish landscapes.

Choice of turbine is a key factor in the potential landscape and visual suitability of small turbines at any site, especially where cumulative effects may occur. Careful choice of turbine at an early stage in the design process will help to ensure an improved landscape fit and avoid complex visual mixes of turbine types in any location. Applicants are encouraged to consider and discuss a number of different turbine options at the pre-planning stage.

There are two main operational forms of small turbine currently available – those which rotate on a horizontal axis and those which rotate on a vertical axis.

3.1 Horizontal axis turbines

3 bladed Proven turbine on tubular tower

2 bladed turbines on lattice and tubular towers

3 bladed turbines on lattice towers

Two main types of turbines have a horizontal axis:

- Domestic/micro turbines.
  These turbines are usually installed for supplying electricity to domestic, agricultural or small scale industrial properties, although excess energy produced may be sold back to the national grid. Some are less than 15m to hub height, although similar larger versions are available. Even though these are considerably smaller than most commercial turbines they have the potential to be taller than buildings (even sizeable farm buildings) and mature trees. They are most commonly three bladed machines mounted on a tubular tower, although 2 bladed machines are becoming more common and lattice towers are sometimes used. 2 bladed turbines tend to have longer, aircraft–like blades whose rotational movement is commonly perceived as being less smooth than 3 bladed models from some aspects, despite their movement being regular. This can be a particular consideration when 2 bladed turbines are viewed in combination with 3 bladed models. Some small scale horizontal axis turbines have yaw arms (to orientate them to the wind) which can be as visible as the turbine blades themselves.

- Small commercial turbines
  Some smaller turbines have the same form as large commercial turbines, with 3 blades and mounted on a solid tapering tower. These tend to be around 50 metres in height minimum. They are most commonly a pale grey colour. Their blade movement, as with the micro turbines, will be faster than larger models and therefore less "restful" on the eye. These may be most appropriate;
  - in industrial settings,
  - adjacent to large scale buildings in agricultural settings where the land has already been heavily modified, and
  - in rural locations where they may relate to any existing similarly styled large commercial turbines, although varying blade rotation speed will be an important consideration.

3.2 Vertical Axis Turbines


(www.wIndturbinezone.com)


(www.legacy.aero.gla.ac.uk)


(www.eng.src-vertical.com)

Vertical Axis Wind Turbines tend not to be as efficient as the more common horizontal axis machines, but they do offer benefits in low wind situations. They also tend to be easier to build, can be mounted close to the ground, and handle turbulence much better. However, the variation in wind loading on blades during revolution causes more fatigue and therefore wear and tear, and in some cases guy wires may be needed to ensure stability. They are generally smaller than horizontal axis turbines and tend to be more common in urban areas where there are townscape issues to consider (such as their scale in relation to their setting, effects of wind tunnelling and resultant turbulence and acoustic concerns). Their forms are more often specially tailored to create a design statement for individual sites.

However, despite the way their characteristics differ from horizontal axis turbines, there are similarities in siting and design considerations.

3.3 Operational requirements for small turbine development

There are certain site requirements for small turbine development which will need to be balanced with other considerations, such as turbine performance requirements, site layout, and acoustic, financial or ecological concerns.

Further advice is given in;

- RenewableUKs "Briefing Sheet on Small Wind Energy Systems";
- RenewableUKs "Generate your own power - your guide to installing a small wind system"; and
- Small Wind Industry (part of the European Wind Energy Association) guidance entitled "Small Wind Turbines Siting – some basic issues".

4. SITING AND DESIGN ISSUES SPECIFIC TO SMALL SCALE TURBINES

In 2009 SNH produced guidance on "Siting and Designing Windfarms in the Landscape", which sets out principles for larger windfarm developments. Many of these are transferrable and should always be considered when designing small-scale development. This guidance highlights the following issues specific to development of single and groups of small turbines.

4.1 Turbine factors

4.1.1 Turbine colour

Whilst larger commercial turbines are generally light grey in colour to reduce their contrast with the sky, there may be greater scope to carefully consider use of other colours of small scale turbines which will reduce their prominence. Small scale turbine development is often located in lowland situations in lower elevation, non-skyline, smaller scale, more enclosed landscapes. In these situations there may be scope to relate the turbines to the landscape backdrop, pattern, tones or colour. A variety of seasons and weather conditions should be considered when choosing turbine colour. There may be locations where small turbines are predominantly viewed against the skyline (i.e where they break the distinction between landform and open sky) and therefore a paler colour may be appropriate. In all cases reflectivity of the turbine components should be minimised.

Care needs to be taken with differing tower/blade colouring. For example, darker turbine heads can look as if they are floating in situations where a light turbine base is seen against the sky. Conversely lighter turbine heads can disappear in bright conditions, leaving the darker tower with no clear rationale for being there.

4.1.2 Turbine size and scale

Small scale turbines will in many cases, depending on their setting, have less landscape and visual impacts than large commercial models. However, there is still scope for this scale of development to visually dominate nearby landscape features. Their size will be key to their relationship with their surroundings. Table 1 shows the relative heights of elements found in the Scottish landscape which may be located near to small scale turbine development.

Landscape element	**Height in metres**
Single storey house	5 metres
1.5 to 2 storey house	6 – 10 metres
Farmyard grain silo	10 metres
Telegraph pole	10.5 metres
Mature forest trees	20 metres
Pylon	Usually around 30 - 35 metres

Table 1 - Height comparison of common elements in the Scottish landscape

Identifying the key landscape and visual characteristics of the area (such as landform and elevation and the presence/absence of woodland blocks), and their sensitivity to (and capacity for) change will help to inform decisions on size.

Whilst large commercial windfarms are often located in isolated upland locations where their scale is difficult to perceive, small turbines are often located close to built features (such as farms, walls, houses or settlements) and vegetation features like hedges or copses which provide scale indicators in the landscape. It is therefore particularly important to ensure that turbines relate to the scale of adjacent landscape features (see relationship with buildings and structures section below).

4.1.3 Turbine Layout/Array

Small scale turbines can be arranged in different layouts, or arrays, and still fulfil operational requirements. In comparison with commercial scale development it is likely that fewer turbines will need to be accommodated. There is potential to present a simple, often sculptural, visual image. This may, however, be more difficult where turbines are viewed with other built elements, such as existing buildings, masts, etc. Turbine layout should, if possible, respond to the patterns in the landscape, eg. arranged regularly in a line parallel to a straight field boundary on flat ground, or grouped in a less formal arrangement on a hillside next to irregular shaped woodland.

Turbines in urban areas should relate to existing landscape features. These turbines are aligned along a pathway and compliment the vertical elements such as lamp posts and trees.
(Photo - Marc van Grieken)

Alignment of turbines should respect underlying landform as this will help to reduce the need for localised levelling and subsequent ground disturbance at turbine bases.

In all cases the turbine layout should be considered when viewed from several viewpoints particularly the most sensitive and/or frequently viewed viewpoints, from which overlapping (or “stacking”) of turbine towers/blades should be avoided.

4.1.4 Micrositing

Micrositing allows developers to change the precise location of turbines to avoid unforeseen constraints, such as deep peat or an important archaeological site. In some cases this has affected the original design concept of a scheme.

Micrositing of small-scale turbine proposals could be of particular concern;

- because even a few metres of movement can make a big difference proportionally to the design.
- where the turbines are near to property – turbines could be moved nearer to or further away from buildings, including dwellings, changing the association of turbine and building;
- where the turbines are arranged in formal regular lines or grids – the turbine position changes could affect the regularity of the design.

Small turbines are likely to be sited at lower levels in less exposed environments than larger windfarms. Nevertheless, developers should be encouraged to carry out complete pre-application site investigations to reduce the need for micrositing. This obviously has cost implications at an early stage in the development process, but it is preferable than the use of detailed micrositing conditions. In the event of a micrositing condition being required within a permission for small-scale turbine development, **the distances should be kept to a**

minimum, proportionate to the height (and therefore spacing) of the turbines to retain the best overall design.
The visual relationship with nearby tall features such as trees and masts is an important consideration. Out with micrositing tolerances reassessment of the proposal may be needed if the design of the scheme changes significantly.

4.1.5 Ancillary infrastructure

Attention to the initial siting and design of any ancillary development will help to minimise impacts and reduce visual clutter. Local Authorities should make clear any issues which they are aware of during any pre-application discussions. In particular:

- Advantage should be taken of local topographical variation or screening features in the landscape to conceal ancillary features where possible.
- Ancillary structures, such as fencing, access tracks and, more occasionally, control buildings should be designed to be appropriate to the scale and character of the landscape and its setting.
- Existing tracks should be used for access where possible. New tracks, if required, should be designed to reflect local character, for example by following a field boundary or woodland edge, rather than cutting across a distinctive or highly visible landform. They should also follow the characteristic patterns of existing tracks in the locality, eg. following the lower fenceline of a field. This may, in some cases, result in slightly longer lengths of track being required than would be needed for a direct route, but will considerably reduce the overall landscape and visual impact. Use of surfacing materials which relate to local landscape character will help to integrate any new features into their setting.
- Any requirement for cut and fill on sloping sites to accommodate supporting infrastructure, such as for access tracks or turbine bases, should be minimised.
- Turbines with integral transformers should be used where possible, especially on exposed sites, although if external transformers are necessary guidance in “Siting and Designing Windfarms in the Landscape” should be referred to.
- Fencing or walling, where required (eg. for safety or agricultural reasons) should reflect the local situation, for example steel palisade fencing may appear inappropriate in a rural situation where drystone dykes are characteristic.
- Small scale turbine development often serves adjacent buildings or is located relatively close to the electricity distribution network for reasons of financial viability. Grid connecting cables, particularly in rural locations, should be buried to reduce clutter of the landscape, unless there is a clear justification not to.

4.2 Location factors

4.2.1 Landscape character

The relevant Landscape Character Assessment (LCA) should be used as a basis for identifying the key landscape characteristics of the site and any special scenic qualities that the area may have. However, in some instances the LCA may be too coarse grained for assessment of small-scale turbine development, and further analysis may be needed. Examination of 1:25000 Ordnance Survey maps and aerial photographs will aid this. In all cases the site and its context need to be considered at a scale appropriate to the development proposal.

The nature and magnitude of impacts upon landscape character are likely to be related to:

- The scale of the landscape. This is one of the primary characteristics likely to require consideration. For instance, is it small scale and intimate or large scale and

expansive? The height of the turbine should seek to complement the landscape and be appropriate in scale;

- Influence on the 'tranquillity' of the landscape. For example, the effect of turbine blade movement may be an issue, which can be mitigated by proposing a model with a slower rotation speed.
- Settlement pattern. As small-scale turbines are more commonly found in settled landscapes they have potential to impact on the landscape character of these unless sympathetically sited. Paragraph 4.3.5 outlines key siting and design considerations.
- Small scale topography. Even small turbines have the potential to dominate small scale topography. Care should be taken not to introduce turbines which would have an overbearing presence on complex or intricate landforms.
- Relationship with distinctive ridge or skylines. Small turbines may affect the simplicity of distinctive ridges or skylines and may be prominent in the landscape even if below these features.

Some or all of these effects may occur over an area wider than the immediate character type in which the proposal sits. Reference to Zone of Theoretical Visibility mapping will help to establish and assess the likelihood and significance of this.

4.2.1 Areas with a strong sense of Wildness

Certain areas in Scotland are valued for their sense of wildness. We have mapped Search Areas for Wild Land and published a policy statement on wildness. New mapping of wildness characteristics in Scotland has also recently been published.

Due to remoteness and poor grid connections areas with a strong sense of wildness tend not to attract proposals for wind energy development. Small scale turbine development adjacent to areas valued for their wildness has the potential to undermine the inherently sensitive wildness qualities of these areas. If this is associated with other development, such as farms, the effects will be reduced. Cumulative issues, with both other turbine developments and other forms of development, will also be important near wild land, and care needs to be taken not to incrementally introduce a level of built development which would erode the special qualities and setting of such areas.

Some locations, close to areas of population, are particularly valued for the sense of wildness they provide relative to urban centres (the Pentland Hills for example). Whilst wildness qualities in these areas will not be as strong as in remote parts of the northwest highlands, they still provide an important recreational resource and should be considered carefully when siting turbines.

4.2.3 Designated landscapes

Landscapes designated for their national, regional or local scenic, designed or recreational quality[3] may be sensitive to small scale wind energy development. The extent of this sensitivity will depend on the nature of the proposal and the landscape qualities which are valued by the designation. The original designation citation, Local Development Plan and documentation such as the SNH NSA "Special Qualities" work will help to establish these qualities and assess the likely impacts of the proposed turbines on these.

[3] such as National Scenic Areas (NSAs), National Parks, Regional Parks, Local Landscape Designations (eg. Areas of Great Landscape Value), National Nature Reserves, Local Nature Reserves and sites listed in the Inventory of Gardens and Designed Landscapes (GDLs)

4.3 Siting and design factors

Good siting and design principles are needed if small scale turbines are to relate effectively to the specific qualities of an area. Key considerations are as follows;

4.3.1 Landform

Smaller turbines have more potential to use landform to restrict their visual impact than larger commercial models. This should be explored, particularly when there are potential adverse impacts on views from sensitive receptors, such as settlements, which could be mitigated through screening. Advantage should be taken of the combined screening properties of topography and vegetation (see woodland section below). However, in certain situations turbines may potentially influence or confuse the perception of landscape. For example a farm may be screened by landform from a certain view, yet the small-scale turbine installed to produce its electricity is visible – this would introduce a built element to the landscape where there was previously nothing evident. In this instance it will be necessary to assess whether this is an acceptable effect on landscape character.

The screening properties of landform and vegetation can be used to reduce visibility of small scale turbines, although a balance is required with the need for a good wind resource.

4.3.2 Landscape pattern and scale

The potential for the design of groups of small turbines to reflect the characteristic patterns in the landscape should be exploited whenever possible. Turbines could be arranged in a straight line where a geometric field pattern or straight road edge exists, or in an informal more scattered group or sweeping line adjacent to an indented woodland edge.

Small scale turbines can be positioned to reflect and accentuate field edge patterns and road or coastal edges (Photos: Marc van Grieken)

There may be situations where proposed turbines do not “sit” happily in the existing scale or pattern of the landscape. For example, it may be preferable in landscape terms to group 3 dispersed turbines to form a single feature in an already visually complex or cluttered landscape. In a larger scale landscape, a single larger turbine with the same generating capacity may be preferable to three smaller ones. This will help to reduce cumulative landscape and visual impacts. However, in lowland situations it is more likely that multiples of a smaller size would be preferable so as not to clash with existing scale indicators in the landscape.

Care should be taken when siting turbines in an already complex or busy landscape not to create an overly cluttered visual image. (Photo: Marc van Grieken)

4.3.3 Focal Features

In many situations small scale turbines cannot be hidden, and they can become focal points in the landscape, partly due to the movement of their blades. However, they are less likely to be prominent over long distances than large/commercial turbines. Despite this, care is still required to avoid visual conflict with existing focal points in the landscape, either in terms of visual confusion or competition, or comparative scale. Small turbines may, where appropriate, have the potential to create new focal points which could;

- introduce a sculptural element into a landscape. This potential is particularly strong where new or unfamiliar turbine designs are developed in relation to contemporary architecture;
- interrupt views to or adversely affect the setting of key landscape features. This effect should be avoided wherever possible;
- highlight settlement which is not currently a prominent feature in a landscape. For example, installing a turbine at a farm which was previously screened by trees or the landform near to an area which has wild land qualities. In such cases turbine location should be reassessed to see if the turbine can be better associated with the steading, building or settlement, to reduce these effects.

Wind turbines should not compete with existing focal features - for example this turbine is not the dominant feature of this view

4.3.4 Perspective

Size indicators within a landscape affect our judgement of visual perspective, and thus our recognition of whether a feature is small or large, far away or near. As increasing numbers of different sized turbines begin to appear in the Scottish landscape it will be important not to create confusion in landscape perspective. For example, if larger turbines are seen in front of smaller ones the smaller ones look further away than they actually are, and if smaller ones are in front of larger ones this gives the impression that the larger ones are nearer than the are in reality. (See Section 5 on cumulative considerations).

4.3.5 Relationship with settlement and urban/industrial landscapes

Small scale turbines are commonly associated with settlement, building groups and other built structures such as silos. It is important to relate the proportion of the turbine to these neighbouring built forms, although this relationship will vary with the context of the site – an urban edge is very different to an isolated farmstead in its scale. It is good practice to;

- Consider the height of the turbine in relation to nearby buildings or structures. The turbine should not have an overbearing presence or dominate adjacent buildings;
- Where a turbine has no direct visual relationship to a building group it is important for its setting to have some logic. Consideration of its relationship to existing settlement pattern is required to give some rationale to its location.
- Greater care is likely to be needed in settled areas designated for their landscape or recreational value, such as Local Landscape Designations (LLDs), Conservation Areas, GDLs, and Countryside Around Towns or Coastal Protection Zones. These will have distinct planning policies which should state what type of development may be appropriate.
- The relationship between small-scale turbines and the setting of and approaches to settlements is important. Care should be taken not to let turbines dominate views of the settlement when approaching on main access routes or when viewed from, for example, popular recreational features outwith the settlement. Views from within the settlement to important views or distinctive landscape features should also be considered when siting and designing new small scale proposals.
- The form of turbine chosen may be influenced by it's proximity to settlement – a 2 bladed turbine may appear less balanced and calm next to dwellings, but be less visually significant in a busy urban setting due to the reduced sensitivity to movement.
- Small scale turbines should be sited in the most appropriate location when viewed from a variety of viewpoints, including settlement, public roads and footpaths.
- Local Authorities may require developers to submit an assessment of the potential impacts on residential amenity where these are of significant concern.

It is important for small-scale turbines to relate well to and compliment the scale of nearby buildings. These turbines are of suitable height and distance from their associated buildings and do not have an overbearing relationship with them. (Photos: Scottish Government website)

4.3.6 Woodland

Trees and vegetation can cause turbulence which affects the efficiency and longevity of turbines. However, there may be potential for trees, woodland or forestry to screen small scale turbines in certain situations (where these don't affect turbine performance), especially in conjunction with undulating landforms. However, care should be taken not to allow turbines to compete with or dominate locally distinctive landmark vegetation features, such as tree knolls, avenues or single specimen trees in parkland.

When proposing a location for a turbine development in relation to broadleaved woodland, seasonal variation in leaf cover should be considered in relation to turbine location the screening properties of the vegetation. When relying on commercial forestry cover to screen turbine views, consideration of felling/restocking regimes will be necessary to ensure that the screening properties of the trees can be maintained during the application life of the turbine.

5. CUMULATIVE CONSIDERATIONS RELATING TO SMALL TURBINE DEVELOPMENT

"Siting and Designing Windfarms in the landscape" (2009, Chapter 5) outlines the main principles to consider when designing new wind energy proposals in landscapes with multiple windfarms. Many of these principles are pertinent to small-scale development in combination with other wind energy proposals.

5.1 Cumulative Effects

In the following situations particular attention should be paid to siting and design considerations when dealing with small-scale development, remembering that sequential cumulative effects are as important as simultaneous or combined views.

5.1.1 In combination with micro renewables

Even micro turbines (below 15m to blade tip) can be prominent in some locations. Groups of turbines can be visually significant, as they draw the eye due to their particularly fast speed of blade rotation. Care is needed not to create situations where views are cluttered or create confusing perspective in combination with small scale turbine development (See paragraph 4.3.4).

5.1.2 Where there are already other small scale turbines in an area.

To avoid multiple small scale turbine developments dominating a landscape the following principles should be considered;

(i) the use of turbines of a similar form, design, colour and scale as those already associated with the particular Landscape Character Type to reduce visual complexity and clutter;
(ii) associating a certain form of turbine proposal with a particular landuse to create some local distinctiveness, such as use of a lattice towers in an industrial area and tubular towers in countryside locations;
(iii) carefully siting a proposed development from important viewpoints (such as a popular hilltop or visitor attraction), in relation to other developments present in the vicinity;
(iv) ensuring that all developments associate in the same way with landscape features, such as farmsteads, forestry, head dykes, skylines or contours ensuring a consistent spatial relationship between small scale turbine proposals and other forms of development, especially tall structures such as masts, pylons and grain silos.

5.1.3 Where there are already larger turbines in an area

When seen in combination with larger turbines, small-scale turbines have the potential to create a confusing and poorly coordinated visual image, in relation to both their form, size and grouping combinations. It may be possible to provide visual links to minimise this by;

- using the same turbine form in views where more than one scale of development is visible; and/or
- creating similarity by having similarly grouped and laid out turbines (eg, in groups or lines of 3, or in even numbers in grids), whatever size they are, in a certain landscape character type.

Although these turbines are all of the same form their differing locations confuse turbine relationship with landscape character. The smaller turbine in the foreground makes the large scale turbine development 'creep' into a more transitional lowland landscape character and brings turbine closer to settlements.

Large and small scale turbines seen together make the judgement of distance and size of landscape features difficult.

The effects of differing blade rotation speeds on different scales of turbine (with the slower speeds of commercial turbines versus faster speeds of domestic ones), may accentuate cumulative effects of the turbines when viewed simultaneously. Situations where turbine speeds would be significantly different should be discouraged.

5.1.4 Where offshore and onshore turbines are seen together

Inshore/offshore proposals may need to be considered in certain coastal locations where small scale turbines are proposed.

Robin Rigg Windfarm in the Solway Firth with several windfarms comprising of smaller turbines on the Cumbrian coast visible in the distance. It is not clear whether the onshore turbines are smaller than the offshore ones, or whether they are the same height as those in the water but a long way away

5.1.4 Filling in gaps between recognised "clusters" of windfarms or wind turbines

The introduction of small turbines between clusters of other windfarms can alter the perception of an area by visually linking all of the developments. The break or gap between windfarm development should be maintained where visual separation is desirable.

5.2 Spatial Planning

Local Authorities are encouraged, through SPP and Scottish Government Planning Advice, to outline in their windfarm spatial plan where all scales of turbine development, including small-scale, are likely to be acceptable. This includes an indication of the desired relationship between emerging patterns of wind development. This should be used as an opportunity to set down siting and design objectives which can be consistently applied to all small scale wind energy development.

Through this process Local Authorities should produce siting and design guidance indicating where and how small-scale turbines would be appropriate in areas where larger turbines already exist. This is most important in transitional landscapes, such as lowland fringes, where larger upland developments can be seen from lower lying ground and vice versa.

FURTHER INFORMATION

For further information contact **Jo Duncan** at joanna.duncan@snh.gov.uk or telephone 01738 458632.

APPENDIX 1
Small- scale turbine development checklist

The order of this table follows the structure of the guidance note. When developing a proposal the aspects not necessarily be considered in this sequence. The location factors such as landscape character, landscape designation or wild land should, for example, be considered first.

Aspect to consider	**Checklist**	**Detailed guidance**
Turbine choice	Have you considered a range of different turbine forms in relation to your site? Do the proposed turbines have the most appropriate form, appearance and blade movement for the proposed site? Would another type of turbine fit in better?	Section 3
Turbine colour	What is the relationship between the proposed turbines and nearby landform and skylines? Are they predominantly seen against the sky or backclothed by landform or trees? Have you thought about how the turbine could look in different seasons and weather conditions? Can turbine colour choice help to make the turbines less prominent?	4.1.1
Turbine size/scale	Have you identified key landscape and visual characteristics (landform/elevation/landcover/built elements/scale indicators)? Does the proposed turbine relate well to and not dominate these aspects?	4.1.2
Turbine array	Is the proposal for a group of turbines? Have you identified where they could be seen from and which are the most sensitive or significant views to the site? How could the turbines best be arranged to relate well to, respect and compliment their setting?	4.1.3
Micrositing	Has the site been surveyed as fully as possible to minimise the need for micrositing, especially near to properties and other tall structures?	4.1.4

Ancillary infrastructure	Have existing tracks been utilised wherever possible? Do proposed tracks fit in with the landscape character and compliment the pattern of existing tracks and road networks? Do proposed tracks use surfacing material which relates to the local landscape character? Do proposed tracks and turbine bases avoid steep slopes and minimise need for cut and fill operations? Do new ancillary features, such as buildings, walls and fences use materials characteristic of the locality and are they appropriate to the scale and character of the landscape? Has visibility of ancillary features been minimised? Is it proposed to bury connection cables?	4.1.5
Landscape character	Has the local Landscape Character Assessment (LCA) been referred to establish the key landscape characteristics of the site? Was the LCA detailed enough? If not, were OS 1:25000 maps and aerial photos used to help establish this? What is the scale of the landscape? Does the proposal relate well to this? Is the landscape tranquil or busy? Will the blade movement of the proposed turbine(s) change this? Is the landform simple or complex and diverse? Will the proposal confuse or undermine these qualities? Is the proposal likely to affect more than 1 landscape character are or type? Does it relate well to all of those it could potentially affect?	4.2.1
Wild land	Does the proposal impact on an area which is considered to have strong wildness character? Does the proposal influence the qualities of or affect the perception of any wild land, either within it, around the periphery or its wider setting?	4.2.2
Designated landscapes	Is the proposal within or near to a landscape designated for its special scenic or recreational qualities? Has the proposal been designed to minimise potential	4.2.3

	impacts on these special qualities?	
Landform	Can local landform features be utilised to limit visibility of the proposal?	4.3.1
Landscape pattern and scale	If the scheme is for more than one turbine, does the layout reflect and compliment existing landform patterns? Could the turbines be grouped better to fit in with landscape pattern and scale?	4.3.2
Focal features	Will the proposed turbine(s) introduce a new focal landscape feature ensure that does not create visual confusion or compete with other notable features? Does the proposal interrupt views to or from existing focal features? Have opportunities to create a new sculptural image been maximised, especially in heavily modified or designed landscapes?	4.3.3
Perspective	Does the proposal create a false or confusing sense of perspective, especially in combination with other wind energy developments? (see cumulative section below)	4.3.4
Relationship with settlement	Do the turbines respect the scale of adjacent buildings? Does the proposal have a logical visual relationship with relation the settlement pattern? Will the turbines dominate approaches to settlement? Have the turbines been sited to minimise impact on people who live in, work in, travel through the locality or use the area for recreation?	4.3.5
Woodland	Can existing woodland be used to help screen the proposed development without affecting turbine performance? If the trees are broadleaved, how will seasonal differences in the vegetation affect how the turbines look at various times of the year? Are there any proposals in the lifetime of the turbines to fell/restock the trees? What effect will this have on their setting?	4.3.6

CUMULATIVE		
General	Have you considered the relationship between the differing blade movement speeds of different developments? Can this be minimised?	Section 5
In combination with smaller/micro turbines	Does the introduction of the turbines create local landscape “clutter”, especially where different turbine designs are being proposed close to each other? Could a turbine with the same form as the existing turbines be used?	5.1.1
In combination with other small-scale developments	Are the proposed turbines similar in form, colour and scale to those already existing in the locality? Does the proposal follow the existing small-scale turbine development pattern? Has intervisibility with other small turbines been minimised from important viewpoints?	5.1.2
In combination with larger turbines	Does the small-scale proposal sit in or associate with the same landscape character type as the larger turbines? If so, does the proposal reflect existing turbine grouping patterns? Have you considered the effect introducing small-scale turbines will have on landscape perspective? Is this likely to create visual confusion? Is the proposal near the coast where there are existing inshore or offshore wind turbines?	5.1.3
Filling in gaps between recognised clusters of windfarms or wind turbines	Will the proposal link 2 previously separate or distinct windfarm areas?	5.1.4
Spatial planning	Does the proposal accord with the spatial plan for wind energy development, where this exists? Does the proposal follow guidelines set down by the Planning Authority in their Planning Guidance?	5.2